In this thesis we remind you of the basic Buchberger algorithm for computing the Gröbner base over commutative polynomial rings. We also observe uniqueness of the Gröbner base for the ideal. Next we research less known, but more effective (for some instances) Faugère $F4$ algorithm. At the end of the first chapter we compare these two algorithms. In the second chapter we analyze a generalization of the Buchberger algorithm for noncommutative rings both for free algebra and factor algebra. On the contary to the commutative case, Gröbner bases can be infinite in this case, even for some finitely generated ideals. Among other things, we investigate quasi-zero elements,i.e. such elements, that we get zero by multiplying them with an arbitrary term, and their role in the division of a polynom by set of polynoms.